

A GEOLOGICAL COMPANION TO GREECE AND THE AEGEAN

Michael Denis Higgins
and Reynold Higgins

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Preface

After a visit to a major library or a large bookstore, even academics may be inclined to feel that there are too many books. However, I feel that this book really does fill an unoccupied niche. This was especially apparent after a visit to the library of the British School at Athens. Despite the huge collections of material on the Aegean region, archaeologists were using declassified British Secret Service documents from the first half of the century for their geological background.

Few guidebook authors can actually visit all the places they write about, and this geological companion is no exception. Most places have been visited by the archaeologist (Reynold Higgins), but the geological cover is a little thinner. We had to rely on maps and scientific publications for parts of Macedonia, Thrace, the islands of the northern Aegean and the Ionian islands. Elsewhere, bibliographic research has been generally complemented by site visits.

The transliteration of Greek place names has presented its usual problems. No overall system has been used, just what 'sounded right' to Reynold Higgins, or what has been most commonly used in publications. However, the reader should have little difficulty in identifying the places referred to in the text.

The region covered by this book straddles two modern countries, Greece and Turkey. As is commonly the case, few geological studies extend across the border, hence many geological boundaries are artificially placed close to the political boundary, rendering correlations across the region difficult: we therefore ask the reader to bear with us if the geology appears to change so rapidly in the eastern Aegean Sea.

This book is the result of a collaboration

between an archaeologist (Reynold Higgins) and a geologist (Michael Higgins). Reynold Higgins provided the original impetus for the book, selected the sites, decided on transliteration of the names and wrote the first draft of the cultural introductions. He helped with some of the bibliographic research, especially that concerning marbles and other decorative stones. He also read through much of the geological text and tried to reduce the amount of jargon. Sadly, Reynold Higgins, my father, died before the completion of the book. I would like to remember particularly his balanced view of the Aegean: one hot day we were visiting the mines of Lavrion when he spotted a tree laden with ripe figs. He immediately began to eat the fruit as fast as he could with the comment, 'Bother the archaeology, I'm only here for the figs.'

Classical authors

A number of classical authors have been referred to in the text: the *Geography* of Pliny the Elder, the *Histories* of Herodotus, the *Geography* of Strabo and the *Travels* of Pausanias have been particularly useful.

Cultural bibliography

The best overall cultural guides to this region are the three Blue Guides to Greece, Crete and Turkey (Barber, Cameron and McDonagh; Black and Norton). Turkey is well covered by *Aegean Turkey* and *Turkey Beyond the Mæander* (Bean; Benn, London). The ancient history of this region is described in the *Oxford History of the Classical World* (Oxford University Press) and *A Traveller's History of Greece*

(Burn; Pelican). Other pertinent books are *The Seven Wonders of the Ancient World* (Clayton and Price; Routledge, London); *The Acropolis* (Hopper; Weidenfeld and Nicolson, London); *An Introduction to Greek Art* (Woodford; Duckworth, London); *Studies in Ancient Technology* (Forbes, Leiden).

Acknowledgments

First, I would like to thank Claude Dallaire for carefully and patiently drafting the maps and diagrams, and Denis Côté for his help. Next come those who helped us in our bibliographic researches: the staff at the libraries of the Institute for Geology and Mineral Exploration, Athens (IGME), the British School at Athens, the Geological Survey of Canada, and the inter-library loan services at Université du Québec à Chicoutimi. Most of the text was read by Georgia Pe-Piper and David Piper, together with Vronwy Hankey, John Underhill, Ian Whitbred, Ursula Roberts, Carol Lister and George Koukis. Many others have helped with advice, including Dov Avigad, W. Vettters, Guy Saunders, Susan Walker, L. Lazzarini, Ayhan Erler, Bernt Schröder, Lucilla Burn, Gyorgy Ozoray and many others. However, I reserve the errors for myself. Finally, we would like to thank Patricia Higgins, Judit Ozoray, Ester Higgins and Zoe Higgins for their perseverance.

Further information

Bibliographical references in the text, which appear as superscript numbers referring to the numbered bibliography, include most of those associated with ancient quarries and mining, but only those most recent, most complete or most accessible for other subjects. For brevity, geological maps published by the governments of Greece and Turkey have not been referenced in the text or acknowledged in the figures, but they have been of immense help. I hope those authors not cited will forgive my omission.

Aerial photographs of many of the sites have been published in *Ancient Greece from the Air*²⁴² and the *Aerial Atlas of Ancient Crete*.¹⁸⁷ Cultural information comes from many sources, but the Blue Guides to Greece, Crete and Turkey have been invaluable. A useful compilation of data is in the *Gazetteer of Aegean Bronze Age Civilisation*.²⁴⁹

Other references to recent published research articles and abstracts of conference presentations can be found using bibliographic databases such as Georef, available on-line or on CD-ROM, at most geology libraries. However, there is much unpublished information only available at the offices of IGME for Greece and MTA for Turkey (for addresses see below).

Geological maps: Greece

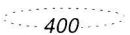
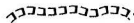
A geological map at a scale of 1:500,000 covers the country in two sheets. There is also a seismotectonic map at the same scale, with earthquake and fault information, as well as simplified geology, at the same scale. Most of the country is also covered by geology maps at a scale of 1:50,000. There are also some hydrogeological maps at the same scale. All these are available from IGME, 70 Messoghion Street, Athens 115 27, Greece.

Geological maps: Turkey

The whole of Turkey is covered by geological maps at a scale of 1:500,000, each accompanied by a short explanatory text. Unfortunately these maps do not always give much information on the types of sedimentary rocks, just their age. The regions described in this book are covered by the Istanbul, Izmir and Denizli sheets. The country has been mapped at a scale of 1:25,000 but these maps have not been published, although a limited number of 1:100,000 compilations of these data are available. All these maps can be obtained from MTA Genel Müdürlüğü, BDT Dairesi Nesriyat Servisi, Ankara, Turkey.

To Judit, Ester and Zoe

LEGEND FOR THE MAPS

	<i>Fault</i>
	<i>Thrust fault, teeth on upper side</i>
	<i>Spring</i>
	<i>Sink-hole</i>
	<i>Ancient shoreline</i>
	<i>Bathymetric contours in metres</i>
	<i>Peak and altitude in metres</i>
	<i>River</i>
	<i>Road</i>
	<i>Monastery</i>
	<i>Ancient city walls</i>
	<i>Quarry or mine</i>

Archaeological time in the Aegean region

Palaeolithic	10000 BC
Mesolithic	6000 BC
Neolithic	3000 BC
Early Helladic (E. Bronze Age)	2300 BC
Middle Helladic (M. Bronze Age)	1600 BC
Late Helladic (Mycenaean, L. Bronze Age)	1100 BC
Geometric	750 BC
Archaic	500 BC
Classical	232 BC
Hellenistic	146 BC
Roman	330 AD

Plates

(between pages 80 and 81)

- 1A. Sea-level stands near Ayia Roumeli, Crete.
- 1B. Beach-rock on Crete.
- 2. Computer-generated relief map of the sea-floor around Greece and western Turkey.
- 3A. Space-shuttle photograph of Attica.
- 3B. The south side of the Acropolis hill, Athens.
- 4. Circular washery for purifying lead ore, near Lavrion.
- 5. The Corinth Canal.
- 6A. Beach-rock on the Diolkos, near Corinth.
- 6B. Fault scarp near Geropotamos, Mani.
- 7A. Fallen columns of the Temple of Zeus, Olympia.
- 7B. The Kylindri quarry near Karistos, Euboea.
- 8. Partially extracted column in the Kylindri quarry.
- 9A. The Meteora region, near Kalambaka.
- 9B. The Meteora.
- 10A. Ancient quarry face near Kastri, Thessaly.
- 10B. Space-shuttle photograph of the northern Aegean.
- 11. Space-shuttle photograph of the western coast of Turkey and the Greek islands.
- 12A. The ancient city of Ephesus.
- 12B. The phreatic explosion crater Stephanos on Nisyros.
- 13. The Temple of Pythian Apollo on Rhodes.
- 14A. Unfinished kouros statue near Apollonia on Naxos.
- 14B. Columnar jointed lava, Glaronissia islands, near Milos.
- 15A. Obsidian in rhyolite, near Demenegaki, Milos.
- 16A. Space-shuttle photograph of western Turkey and the Aegean.
- 16B. Ammoudha quarries at Phalasarna, Crete.